

described in detail in U. S. Pat. No. 5,713,456, incorporated herein by reference.

Stabilization device **14** includes a belt **70** including an upper flight **72** and a lower flight **74**. A drive roller **76** provided adjacent an intake end of belt **70** is configured to drive belt **70** and upper flight **72** at a high speed (e.g., 400–800 feet per minute in an exemplary embodiment). A nose roller **78** defines an outfeed or exhaust end of belt **70**. Rollers **76**, **78** are positioned to provide a curved intermediate section of belt **70** having a progressively decreasing radius of curvature in the preferred embodiment to progressively increase centrifugal forces applied to articles **38a** thereon. The described arrangement causes articles **38a** being conveyed to remain substantially stationary or stabilized in a laterally-distributed arrangement upon belt **70**. Such minimizes lateral movement of articles **38a** relative to adjacent articles **38a** as such articles are conveyed to nose roller **78** toward takeaway device **18**.

Nose roller **78** preferably defines a substantially horizontal exhaust section of belt **70** adjacent the outfeed end of stabilization device **14** to assist in the gentle transfer of the stabilized articles **38a** as such articles are propelled into free-flight along a flight path **88** towards second sorter **16** and take-away device **18**.

An air manifold **79** is provided downstream of nose roller **78** and is oriented to emit an air stream **81** in a generally horizontal direction along the direction of travel of articles propelled from stabilization device **14** to urge such propelled articles along path **88**. The emitted air stream **81** helps direct propelled articles to second sorter **16** and take-away device **18**.

Air manifolds **60**, **62**, **79** can be implemented in a variety of configurations. Air manifolds **60**, **62**, **79** are configured to emit air or other gas in a predefined general direction. An exemplary configuration of individual air manifolds **60**, **62**, **79** is an air knife available from Exair Corporation having designation EXAIR-Knife. Other configurations of air manifolds **60**, **62**, **79** can be utilized.

Second sorter **16** is located downstream of stabilization device **14** and is configured to sort propelled articles **38a** according to a second product characteristic, such as the optical quality of articles **38a**. In an exemplary embodiment, second sorter **16** comprises an optical inspection and sorting station as described in U.S. Pat. No. 5,526,437, incorporated herein by reference.

The described second sorter **16** configured as an inspection station and sorting station includes a housing **80**. Housing **80** contains an optical inspection component **82**, such as a camera in the described embodiment. In addition, second sorter **16** also includes a product diverter **84**. An exemplary product diverter **84** comprises an air manifold including a plurality of laterally-distributed air nozzles individually aligned with articles **38a** moving along path **88**. Further, second sorter **16** includes a computer processor **86** within housing **80** in accordance with the preferred embodiment. Inspection component **82** and product diverter **84** are coupled with internal processor **86** of second sorter **16** as illustrated. Processor **86** may be configured to execute automated sorting logic programs to implement sorting functions of sorter **16**.

Is More specifically, inspection component **82** and product diverter **84** are positioned adjacent flight path **88** of articles **38a** propelled from stabilization device **14** towards take-away conveyor **18**. Inspection component **82** is positioned to view the stream of articles **38a** propelled along flight path **88**. Inspection component **82** provides optical

characteristics or information of individual articles **38a** to processor **86**. In exemplary configurations, inspection component **82** comprises a color, monochrome or infrared sensitive camera.

Processor **86** executing the automated sorting logic program analyzes the received optical characteristics of individual ones of articles **38a**. Processor **86** is configured via the programming to identify selected articles **38c** to be sorted responsive to the optical characteristics of the articles. Product diverter **84** is configured to operate to sort the identified articles **38c** responsive to control from processor **86**. In accordance with the described embodiment, responsive to the execution of the automated sorting logic program using the optical information from inspection station **82**, processor **86** instructs product diverter **84** to divert the selected ones of articles **38c** from flight path **88** depending upon the individual optical characteristics.

Referring to FIG. 4, operations of product diverter **84** are described in detail. Product diverter **84** selectively emits an air stream **85** from an appropriate nozzle of the air manifold in a substantially downward direction to sort selected articles **38c** propelled from stabilization device **14**. Air stream **85** selectively emitted from product diverter **84** diverts selected articles **38c** away from flight path **88** into a downward path **89** away from take-away device **18**. Such diverted articles **38c** can be subsequently discarded, re-inspected, processed, etc. Further details of the operations of the described second sorter **16** are provided in the '437 patent incorporated by reference above.

Nondiverted articles **38a** continue along flight path **88** and are directed to take-away device **18**. Take-away device **18** comprises a conveyor in the illustrated embodiment configured to receive the nondiverted articles **38a**. Articles **38a** received upon take-away device **18** are propelled by conveyor **90** in a downstream direction away from sorting apparatus **10** for further processing, packaging, etc.

In compliance with the statute, the invention has been described in language more or less specific as to structural and methodical features. It is to be understood, however, that the invention is not limited to the specific features shown and described, since the means herein disclosed comprise preferred forms of putting the invention into effect. The invention is, therefore, claimed in any of its forms or modifications within the proper scope of the appended claims appropriately interpreted in accordance with the doctrine of equivalents.

What is claimed is:

1. A sorting apparatus comprising:

- a first sorter configured to receive plural articles to be sorted and define a plurality of discrete courses of travel for the articles, the first sorter having an air manifold configured to emit an air stream intermediate adjacent courses of travel in a generally downstream direction to sort at least some articles according to a first product characteristic from remaining articles and direct the at least some articles intermediate adjacent courses of travel;
- a stabilization device located downstream of the first sorter and configured to stabilize the at least some articles received from the first sorter;
- a second sorter located downstream of the stabilization device and configured to sort at least some additional articles from the stabilized articles according to a second product characteristic; and
- a take-away device located downstream of the second sorter and configured to transport the at least some additional articles.